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IN THE APPLICATION

OF

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FOR A

REAL DRUM TRIGGER MONITOR AND AMPLIFIED TONE MODULE

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REAL DRUM TRIGGER MONITOR AND AMPLIFIED TONE MODULE

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Patent Application Serial No. (to be assigned), filed July 28, 2003.

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention relates to musical instruments, and particularly to electronic percussion instruments.

2. DESCRIPTION OF THE RELATED ART

A conventional acoustic drum consists of a hollow drum shell having one or more drumheads held in place by head hoops. While the drumhead provides the initial vibration, the hollow drum shell provides the acoustic structure necessary to provide the resonant components which gives the drum its distinctive characteristics.

Mesh drumheads have commonly been used to provide a silent surface for drummers wishing to practice in silence without generating the accompanying distinctive drum sound. Electronic

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drum synthesizers, which pick up the vibration of the drumhead and transmit the signals to external amplifiers, are known. An electronic trigger, often a piezoelectric sensor mounted in the vicinity of the drumhead, detects the vibrations of the drumhead and routes an electronic signal to a device having a Musical Instrument Digital Interface (MIDI), which processes note and velocity information and generates a tone according to processed data received.

Japanese Patent No. 11-173876, published in February 1999, discloses a drum having a mesh head, and a circuit module that converts the vibration of the head into an electronic signal that is then played through a loudspeaker. Furthermore, U.S. Patent No. 4,700,602, issued to Terry Bozzio in October 1987, discloses an electronic drum having a number of transducers disposed within the drumhead that convert percussion to electrical signals, and a synthesizer that simulates the sound of a variety of instruments by modifying the signal generated by the transducers. Neither patent teaches or discloses placing a speaker inside the drum to more realistically recreate the drum sound, or to facilitate the transportation of the device.

In addition, U.S. Patent No. 3,748,367, issued July 24, 1973 to Lamme et al., describes a microphone-based percussion

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instrument whose signal actuates an electronic tone generator. The signal is amplified and then emitted through a loudspeaker. U.S. Patent Publication No. 2003/0004603, published January 2, 2003, teaches an apparatus, which converts percussion signals, triggered by a piezoelectric sensor, into digital signals.

As disclosed in the aforementioned patents and publications, there has been effort directed to sensing the vibrations of instrument drumheads and transmitting the vibrations to electronic synthesizers, amplifiers, and speakers external to the drums themselves. Although serving several purposes, these devices do not satisfy the drummer's desire to have the amplified or otherwise synthesized sound emanate directly from the drum triggering the sound, nor do they address the issue of portability and ease of use.

None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed. Thus a real Drum Trigger Monitor and Amplified Tone Module solving the aforementioned problems is desired.

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SUMMARY OF THE INVENTION

The present invention is a real drum trigger monitor and amplified tone module, hereinafter called an electronic drum, satisfying the desire of performing drummers to have realistic electronic drums that have the audible drum sound coming directly from the instrument activating the sound being heard. This is accomplished by mounting a speaker subsystem and patch capability inside an actual acoustic drum shell with a mesh drumhead and electronic trigger.

A first embodiment includes a hollow drum shell having a mesh drumhead, a piezoelectric trigger in the vicinity of the mesh drumhead, and an integrated speaker subsystem. The trigger generates an input signal to an external tone-processing device, which then feeds a signal back into the drum shell to the speaker subsystem.

A second embodiment of the invention includes an attachable sound module, which incorporates an analog-to-digital converter, a tone processor, a digital-to-analog converter, and an amplifier, which feeds the speaker subsystem. The tone processor includes a microcomputer, memory, and program instruction code stored on the memory. This embodiment includes the capability to accept a trigger signal from an external

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triggering device, as well as the capability to supply its own trigger signal to an external device. Furthermore, the sound module incorporates a MIDI interface, which allows it to communicate with other MIDI compatible sound devices to supply additional tones or edit existing tones. The device includes an electronic card reader for reading additional tone information into onboard memory.

A further embodiment of the real drum trigger monitor and amplified tone module comes without the mesh drumhead and trigger sensor, and is designed to be mounted to an existing electronic percussion pad that only provides an output from a trigger sensor. Mounted beneath the existing percussion pad in place of, and plugged into, the sound module of the present invention, the combination of a traditional electronic percussion pad and the real drum speaker monitor extends the capability of a drummer's existing instrument to produce audible music without the expense of buying a complete new electronic drum.

Another embodiment of the present invention is a kit, with which a user may transform their "real" drum or electronic percussion pad into a real drum trigger monitor. The kit would

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include the mounting hardware necessary to mount a pair of speakers within the existing drum shell.

Accordingly, it is a principal object of the invention to provide a real drum trigger monitor and amplified tone module having an acoustic drum shell containing an electronic trigger and at least one speaker, thereby generating audible sound directly from the instrument triggering the electronic tones.

It is a further object of the invention to provide a real drum trigger monitor and amplified tone module having a trigger sensor, a speaker subsystem, and a sound module having an analog-to-digital converter, tone processor, digital-to-analog converter, and amplifier all built into the drum body.

Still another object of the invention is to provide a real drum trigger monitor and amplified tone module that is self-contained, can be easily transported and is easy to operate.

It is a further object of the invention to provide a real drum trigger monitor and amplified tone module that is MIDI compatible, that can interface to other sound systems, and that transmits and receives data to/from other compatible sources.

Still another object of the invention is to provide a device, which mounts to a traditional electronic percussion pad and generates audible sound triggered by the collocated pad.

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Still another object of the invention is to provide a kit consisting of mounting hardware with which to mount a pair of speakers within an existing drum shell.

It is an object of the invention to provide improved elements and arrangements thereof for the purposes described which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

These and other objects of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. **1** is a perspective view of a real drum trigger monitor and amplified tone module according to the present invention connected to an external MIDI device.

Fig. **2** is an exploded, perspective view of the real drum trigger monitor and amplified tone module according to the present invention.

Fig. **3** is a perspective view of an alternate embodiment of the real drum trigger monitor and amplified tone module according to the present invention having a sound module removably mounted to the side of the drum shell.

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Fig. **4** is a representative block diagram of the sound module of the real drum trigger monitor and amplified tone module according to the present invention.

Fig. **5** is a perspective view showing a conventional electronic percussion pad modified for use with a real drum trigger monitor and amplified tone module according to the present invention.

Similar reference characters denote corresponding features consistently throughout the attached drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a real drum trigger monitor and amplified tone module, designated generally as **100** in the drawings. The real drum trigger monitor and amplified tone module **100** satisfies the desire of drummers to have realistic electronic drums that have the audible drum sound coming directly from the instrument, as opposed to an externally mounted speaker system.

As shown in Fig. **1** and **2**, the real drum monitor **100** is an actual drum shell **102** having a mesh drumhead **104** mounted to the drum shell **102** and utilizes a foam damper **226** to make contact with trigger sensor **206**. The trigger sensor **206** is centrally

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mounted on bracket **228**, which itself is mounted to upper speaker mounting plate **205**. The sensor **206** may be one of several piezoelectric drumhead vibration sensors commercially available, such as the Pintech® RS-5 head/shell mount acoustic drum trigger. A spacer ring **204** inserted between the drumhead **104** and the speaker mounting plate **205** provides the separation necessary for the foam damper **226**. A retaining ring **202** having uniformly spaced apertures for receiving mounting bolts **203** mounts on top of the drumhead **104** and is secured to the body of the drum shell **102**.

The signal from trigger sensor **206** is routed by cable **232** through connector **110** and cable **112** to an external Musical Instrument Digital Interface (MIDI) device **108** having a tone processor and amplifier. External tone processors are known to those in the music field and operate on note and velocity information to produce a tone according to processed data received. The tone processor outputs an analog signal to an amplifier, which electrically transmits an amplified analog signal back into the electronic drum **100** through cable **112** and connector **110**. Cable **234** routes the signal from the connector **110** to the speaker subsystem mounted inside the drum shell **102**.

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The speaker subsystem is comprised of a low frequency speaker **208** and a high midrange speaker **216** wired in series through a crossover circuit **230**. Crossover circuits are known in the electronic audio field and crossover circuit **230** effectively limits the speakers **208, 216** to their respective portion of the audible frequency bandwidth. An upper speaker mounting plate **228** with a center speaker hole is bolted on top of the low frequency speaker **208**. Plate **228** is sized to abut the outer periphery of the drum shell **102**. As previously mentioned, spacer ring **204** is mounted on top of the mounting plate **205** and provides the space required for foam damper **226**. Retaining ring **202** is placed over the mesh drumhead **104** and is secured to the drum shell **102** with mounting bolts **203**.

The high midrange speaker **216** is bolted to a lower speaker plate **212** having a center speaker hole **222** and at least one small vent hole **214**. A chamber separator housing **210** is mounted to the lower speaker mounting plate **212** and operates to prevent the air pressure from the low frequency speaker **208** from interfering with the high midrange speaker **216**. The outer periphery of the lower speaker mounting plate **212** abuts the bottom of the drum shell **102** and is held in place by lower retaining ring **218** and lower mounting bolts **240**.

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Different configurations, types and sizes of speakers may be used, as well as different shell sizes and shell materials to produce a different tone and resonance. Wood shells produce a natural drum tone, while plastic and composite material produces "boomier" tones. Decibel levels are also determined by shell size, shell material, speaker size, and amplifier wattage.

Fig. **3** shows an alternate embodiment of the present invention **100**, which incorporates a small self-contained battery powered MIDI sound module **302** mounted directly to the drum shell **102** with mounting hardware **304**. The sound module **302** accepts the signal from the trigger sensor **206** and, based upon stored or external tone characteristics, creates audio signals, which are played back by the speakers **208**, **216** within the electronic drum **100**.

The sound module **302** has a rear-mounted connector **310** which mates with connector **110** on the surface of the drum shell **102**. Alternatively, connector **110** may be disposed on the inside surface of drum shell **102** and the sound module **302** mounted to the interior of the drum shell **102**, thereby eliminating from view the internally mounted sound module **302**. Disposed in the sound module **302** is an electronic card reader **306** for loading different tones into the sound module from a portable electronic

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storage medium **314**. Furthermore, the sound module **302** has disposed thereon a conveniently accessible user interface, comprising, at a minimum, input and output connectors, and a control panel **316**. Finally, the sound module **302** has a battery holder **312** for accepting a conventional rechargeable battery (not shown). Alternatively, the sound module **302** may be powered from 120 VAC using a commercially available AC/DC converter.

As shown in the representative block diagram of Fig. **4**, the drum trigger **206** produces a distorted voltage signal **402** as a result of the vibrating drumhead **104**. The voltage level of this distorted signal **402** may be adjusted by sensitivity control **404** before being digitized by analog-to-digital converter **406**, which outputs a digitized signal **408** to the tone module **410**. Alternatively, connectors on the sound module **302** allow an external device **426** to process the drum trigger signal or to provide its own sensor input through connector **342**.

The tone processor **410** accepts digitized trigger data in conjunction with selected tone characteristics to create synthetic sounds. These tone characteristics are selected via the user interface **316**, and may be read from a variety of sources, including on-board memory, an external MIDI device **424**, and a card reader **306**. Tone data includes, but is not limited

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to, velocity, curve, note number, sensitivity, amplitude, and channel number. The tone processor **410** stores multiple tones and patches multiple 16-bit digital audio samples. The tone processor **410** contains a microprocessor, read only memory (ROM), random access memory (RAM), assorted logic, and software loaded on the memory.

The tone processor **410** outputs digital data **412** to an digital-to-analog converter **416**, which then converts the digital data into an analog signal **418**, which may be further attenuated by means of control panel **316** and control **414** before being sent on to the amplifier module **416** which outputs two pairs **430**, **432** of balanced analog signals, one pair **430** driving the internal drum speakers **208**, **216**, and the other pair **432** capable of driving an external speaker or amplifier. The amplifier module **414** may have its own control capability by means of control panel **316**.

The present invention **100** is capable of interoperating with commercially available devices at several key interface points. As previously disclosed, the output of the trigger sensor **206** may serve as an input to other electronic devices, and the trigger output of external devices may serve as input to the sound module **302**. In addition, the sound module **302** is a MIDI

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device, adapted to interface with commercially available MIDI devices **424** for providing such functions as reading in tone information and editing existing tones. Furthermore, the sound module **302** allows the speaker subsystem of the present invention to be driven by external analog devices **428**.

Fig. **5** discloses a further embodiment of the present invention having an electric drum **500** which allows traditional electronic percussion instruments having only a trigger sensor output, such as the Roland® PD120 12-inch Mesh head V-Pad **504**, to be easily mounted and wired to the electronic drum **500**, thereby producing audible sound when triggered. The modification requires that the user's traditional electronic percussion instrument **504** be mounted directly to the top of the drum shell **502** and be held in place by long mounting bolts **506** received by mounting hardware **512**, upper mounting plate **508** being disposed between the meshhead **504** and the low frequency speaker **208**. The modifications are straightforward and may be accomplished by most drummers and those experienced in the field of percussion instruments. A cable **510** would connect the user's drum to the external trigger input connector **342** on the removably attached sound module **302** discussed in detail above.

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In its simplest form, the present invention comprises a hardware mounting kit having only the proprietary upper speaker mounting plate **205**, spacer ring **204**, and the lower speaker mounting plate **212**. A user, supplying a real drum, a drum trigger, a tone module, a pair of speakers, and an external tone module, may then transform their percussion drum into a real drum trigger monitor and amplified tone module, as described above. An alternate use of the kit would be to convert an electronic percussion pad into a real drum trigger monitor by having the user provide their own percussion pad, real drum, and speakers.

It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

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